Boundaryless Management

Creating, transforming and using knowledge in inter-organizational collaboration

A literature review

Jesper Blomberg & Andreas Werr

Stockholm School of Economics
Box 6501
SE-113 83 Stockholm, Sweden
E-mail: jesper.blomberg@hhs.se; andreas.werr@hhs.se

SSE/EFI Working Paper Series in Business Administration
No 2006:2

January 2006

Abstract

Current literature on organizations often argues that firms are becoming increasingly dependent on knowledge residing outside their own boundaries requiring organizations to increase their entrepreneurial abilities and make their boundaries more flexible and permeable. This paper reviews the literature on what might be called interorganizational knowledge work. Implied in this focus is an assumption of clear organizational boundaries. Rather than taking these boundaries and their importance for granted, the current review, however, aims at relativizing these boundaries. By focusing the empirical phenomenon of collaboration between individuals in different organizations, four different streams of literature with different constructions of the organizational boundary and its importance were identified: the literature on learning in alliances and joint ventures, the literature on collaboration in industrial networks, the literature on social networks and communities of practice and finally the literature on geographical clusters and innovation systems. The above four streams of the literature are reviewed with a special focus on the following three questions:

1. What is the role of (organizational) boundaries in interorganizational knowledge work

2. What do we know about how these boundaries can be overcome?

3. What are the implications for managing interorganizational knowledge work spelled out in the literature?

Content

Introduction

Current literature on organizations often argues that firms are becoming increasingly dependent on knowledge residing outside their own boundaries. In the knowledge society, collaboration between firms in order to exploit complementarities in knowledge and capabilities is increasingly becoming a necessary ingredient in organizational action in general (Teece, 1998) and innovation in specific (Powell, Koput, & Smith-Doerr, 1996). Trends like globalization, deregulation, the proliferation of IT, the fusion of product architectures and technological fields all put pressures on organizations to engage in collaborative initiatives in order to seize the emerging opportunities. In order to survive in this emerging environment, it is argued that organizations need to increase their entrepreneurial abilities and make their boundaries more flexible and permeable (Teece, 1998).

It has also been shown that such collaboration is not without problems. Barringer and Harrison (2000), referring to reports by PriceWaterhouseCoopers and KPMG, report failure rates of 50-70% of business alliances. It has also been pointed out that such collaborations are difficult to manage and a number of potential risks have been identified – e.g. the risk of loosing proprietary information due to the partner's opportunistic behaviour.

Against the above background, this paper reviews the literature on what might be called interorganizational knowledge work. By this we set focus on tasks that require sophisticated knowledge to be solved and involve a certain amount of non-routine problem solving. We especially focus on the interorganizational aspects of these tasks i.e. the cooperation crossing formal organizational boundaries enacted when fulfilling the tasks. Such cooperation may range from informal contacts to individuals outside the own organization taken to obtain some input in the problem solving task to formal alliances set up between two or more organizations for the joint development of new products or services.

In focusing on "interorganizational knowledge work", the formal organization and its boundaries are given a strong position. However, rather than taking these boundaries and their importance for granted, the current review aims to at least relativize these boundaries. By focusing the empirical phenomenon of collaboration between individuals in different organizations, four different streams of literature with different constructions of the organizational boundary and its importance were identified: the literature on learning in alliances and joint ventures, the literature on collaboration in industrial networks, the literature on social networks and communities of practice and finally the literature on geographical clusters and innovation systems.

The above four streams of the literature are reviewed with a special focus on the following three questions:

1. What is the role of (organizational) boundaries in interorganizational knowledge work
2. What do we know about how these boundaries can be overcome?
3. What are the implications for managing interorganizational knowledge work spelled out in the literature?

We will start of with a review of each of the streams of literature before engaging in a comparative discussion between them. The chapter concludes with an integrating framework

summarizing some of the variables identified as important moderators of interorganizational knowledge work and some points of departure for future studies.

Current approaches to Inter-Organizational Knowledge Work

To delimit any area of social-scientific knowledge is a somewhat paradoxical task. All areas of knowledge are connected to other areas of knowledge, both in the world of theory (logically), and in the empirical (social/material) world. The boundaries drawn between different streams of literature are always to some extent arbitrary and constructed from pragmatic motives. The strands of research described in the following should be viewed as a first description of the results from contemporary research on inter-organizational knowledge work. Even if this research does not use our construct 'inter-organizational knowledge work' it is still research that we think covers the subject matter we would like to understand. One could claim that much more business and social research is relevant, but we have to start somewhere.

Learning in Alliances and Joint Ventures

The first strand of the literature to be reviewed emerges from a strategic management perspective and the observation that knowledge assets are becoming increasingly important for firm survival and success. Gaining access to and creating new knowledge thus has in the past decade become an increasingly important motive for interorganizational collaboration. The number of publications dealing with learning in alliances and joint ventures has increased rapidly, with a peak in 2001. Still, however, the topic of learning in alliances and joint venture is one attracting significant attention in both practice and the academic world (see **Figure 1**).

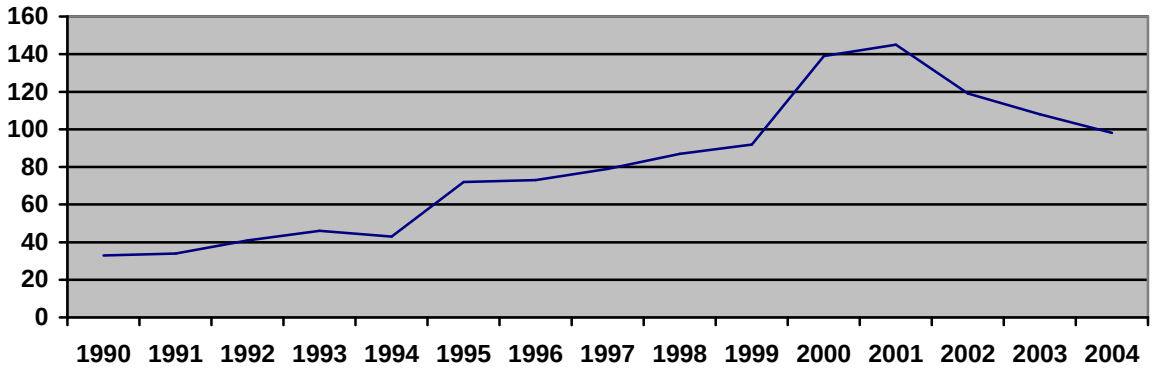

Figure 1. Number of hits in ABI inform when searching for (Alliance OR Joint venture) AND (Learning)

A foundation of the literature dealing with interorganizational collaboration (IOC) and knowledge acquisition and creation is the view that organizations may derive competitive advantage from their specific knowledge and skills assets. Interorganizational collaboration with a focus on knowledge and skills thus becomes a way of gaining competitive advantage. It becomes a way of maintaining and expanding a company's knowledge base, but also of creating new competitive products and services by pooling the expertise of several companies. This has become increasingly important as knowledge development is described as increasingly fast, specialized and globalized, thus making it hard for the single firm to keep up (Badaracco, 1991).

Inkpen and Dinur (1998) identify three different learning agendas in interorganizational collaboration. Firstly, organizations may learn more about how to deal with and manage interorganizational collaborations. Secondly, collaboration may be a way to access (rather than acquire) a specific knowledge or skill. This may be the case when firms decide to pool their respective expertise to create a unique product or service. Finally, organizations may enter interorganizational collaboration in order to acquire or in collaboration generate new knowledge that may improve strategic aspects of an organization's operations. It is mainly technical knowledge and capabilities that are dealt with in this context (Barringer et al., 2000). (See also Tsang (1999) who distinguishes between "learning the other partner's skills" and "learning from strategic alliance experience" and Grant and Baden-Fuller (2004) who distinguish between knowledge accession and knowledge acquisition and argue that the former is the main advantage of IOC).

Interorganizational colaboration (IOC) for learning reasons is viewed as more important in industries that are complex, expanding and where the sources of expertise are widely dispersed. In these kinds of situations, new product development will typically be carried out in networks. (Barringer et al., 2000). An industry often mentioned and studied in this context is the biotech industry. It has been shown, that the number of alliances a firm participates in, and the extent to which it can place itself in the center of networks influences its learning (Powell et al., 1996). A recurring distinction made when discussing interorganizational collaboration for learning is also that between exploration and exploitation, which are often claimed to follow different logics and pose different managerial challenges (see e.g. Bidault & Cummings, 1994).

An important driver of interorganizational collaboration for learning is the specific character of knowledge firms want to gain. If knowledge is complex and to a large extent tacit, it may be difficult to price and transfer by other means than interorganizational collaboration (Barringer et al., 2000). While the main focus in the literature has been on the claimed advantages of IOC for learning there have also been identified some risks, mainly related to the danger of firms loosing critical knowledge to competitors through collaboration.

While the above has dealt with the rational for IOC from an alliance and joint-venture perspective, large parts of the literature are devoted to identifying enablers and barriers to learning in IOC. Inkpen (2000) provides a "framework of knowledge acquisition" in Joint Ventures based on a review of the literature. This contains 10 factors affecting the knowledge acquisition of a partner in an IOC (see Figure 2)

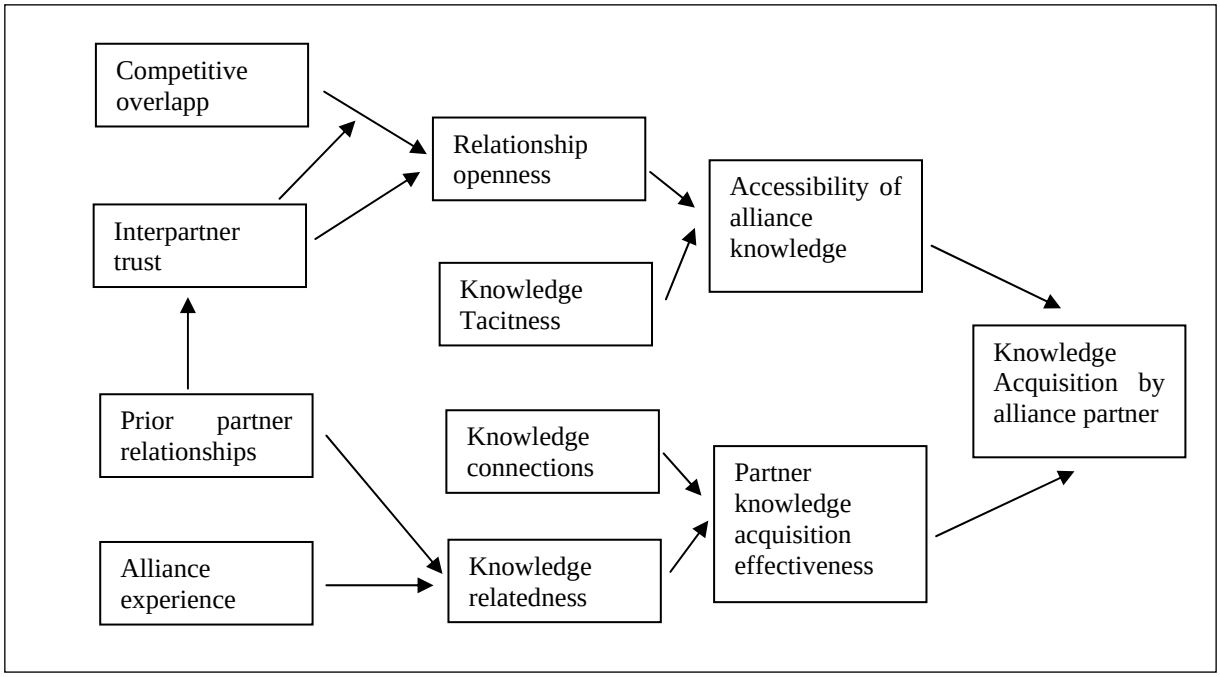

Figure 2 Framework for knowledge acquisition in interorganizational collaboration (Inkpen, 2000)

This framework, like most of the literature in the field, points at both the character of the knowledge (tacit/explicit, level of complexity, embeddeness, etc.), its interrelatedness with the acquiring partners knowledge base (c.f. absorptive capacity) and the character of the relation between the alliance partners – its openness and trustfulness. While the focus in this literature is generally on the absence of conflict and the compatibility of knowledge, it has also been pointed out, that a certain amount of tension in the alliance relationship is an important prerequisite for learning (Hermens, 2001; Phan & Peridis, 2000).

The main challenge in interorganizational learning, according to Inkpen (2000), is to "incorporate disparate pieces of individual knowledge into a wider organizational knowledge base". The challenge is thus not only one of getting access to the knowledge, but also of finding ways of acknowledging and building on this knowledge. This is often dealt with as an organization's "absorptive capacity" (Cohen & Levinthal, 1990; Kumar & Nti, 1998; Zahra & George, 2002).

In addition to these factors, a number of related factors influencing learning in IOC are identified and discussed. These include the partner's learning intent, knowledge ambiguity, culture towards learning, size and structural form (Simonin, 2004), the organization of the alliance (Gerwin & Ferris, 2004) and interpersonal conditions in the alliance (Soekijad & Andriessen, 2003) (see also Aadne, von Krogh, & Roos, 1996).

More concretely, processes of learning in IOC may take a number of different forms. Inkpen and Dinur (1998) identify four "knowledge management" processes – technology sharing, JV parent interactions, personnel transfers and strategic interaction. Common to these is that they all expose individuals to new stimuli and provide opportunities for interaction in which viewpoints and interpretations may be discussed and challenged.

To what extent then is learning in IOC just about copying the knowledge and procedures of another organization? Holmqvist (2003) argues that

> "Learning occurs through interaction and exposure to various sources of information Rather than assuming that interorganizational learning creates 'complete' behavioural couplings between organizations, thus blurring their boundaries altogether, we should perhaps conclude instead that interorganizational learning is selective, in that it only creates semi-interdependencies between organisations and always leaves a 'core' of organisational identity unaffected by and learning with other organisations: indeed, that joint learning with other organisations may be a mechanism for maintaining this core" (p. 459).

This indicates, that interorganizational collaboration may be not only a way of copying and adapting, but also a way for more clearly identifying the nature and core of the focal organization.

This brief review of the literature on learning in interorganizational collaboration points at a number of common themes and neglects. Firstly, the literature generally has a positive bias in that it highlights the advantages of IOC, without dealing with the risks. Barringer (2000) identifies a number of potential risks, including loss of proprietary information, management complexities, financial and organizational risks, the risk of becoming dependent on the partner, partial loss of decision autonomy, the risk that partners' cultures may clash, loss of organizational flexibility and antitrust implications (p. 386).

Furthermore, little is said in the literature on how alliances should be managed. The main focus is on the rationale for alliances as well as the governance of these. This neglect of the management of IOC for learning is an important one, as Bidault and Cummings (1994) have argued that there is an inherent tension between the logic of innovation (and analogously learning) and the logic of partnerships, where the former require flexibility, open communication, etc. whereas the latter are often viewed to require firm management with clear contracts. In general, the literature on the management of IOC is strongly concerned with the initial contract. Only to a limited extent the literature has acknowledged the processual and evolving nature of many IOCs (Doz, 1996; Ring & Van de Ven, 1994).

When it comes to the view of knowledge reflected in this literature, this generally uses the tacit-explicit dimension as an important way of characterizing knowledge. Knowledge is most often viewed as a rather well defined entity that can be "learned" or transfered in the IOC. Less common is a view of knowledge as something emerging in the collaboration between individuals. Linked to this, the literature is also strongly focused on the interorganizational dimension, mainly neglecting the interpersonal collaboration in which learning takes place.

Finally, boundaries are not explicitly discussed in the literature. Implicitly, however, the organizational boundary is taken for granted as a strong one. It is observable in the literature mainly through its effects creating diverging interest between partners (leading to the risk of opportunistic behaviour, knowledge hording, etc) and different "knowledge cultures" impeding the transfer of knowledge

Collaboration in industrial networks

While the previous research stream focused on the organization as the main object of analysis, the current stream focuses on the organization as a part in larger industrial networks, making collaboration and knowledge exchange a natural rather than extraordinary part of organizational life.

Going back to early 1970's, research on distribution systems identified that industrial relations between suppliers, distributors and customers were characterized by inter-organizational dependency, long term stability and that firms did a large part of their business with relatively few other companies (Mattsson, 1976). Buyers and sellers seemed to be interacting during relatively long periods of time, adapting to each other and thereby developing interdependencies with each other. The early empirical findings, largely emanating from Swedish distribution and organizational research (Waldelin, 1974; Håkanssson & Östberg 1975; Melin, 1977; Håkansson & Melin, 1978), gave birth to a partly new approach to studying and analyzing network relations and network activities in and between firms. In the early 1980's this "industrial network approach" can be said to have become an integrated perspective with explicitly stated theoretical assumptions and producing various empirical studies. Some of the more influential texts from this period are the studies of exchange relations in different types of market situations (Håkansson 1982), firms' marketing problems in networks of organizations (Hammarkvist et al, 1982) and industrial politics in markets as a network perspective (Hägg & Johansson, 1982).

The findings in these studies were far from how industrial relations was described within the dominant management discourse, academic and pragmatic, at the time. Well summarized in Porter (1980) the normative view on running a successful business was rather that it should have a large number of similar suppliers and customers to be able to put price pressure on them or to switch to the ones with lowest cost or highest willingness to pay. With a focus on competition, rather than on co-operation, a firm was supposed to gain competitive advantage.

The network approach has similarities with the resource dependency perspective within organizational science (Pfeffer & Salancik, 1978), and thereby also has a touch of the basic argument of population ecology (Freeman, 1982) stating that organizations are highly limited by their environments. Together with resource dependency and population ecology, the industrial network approach is contesting the view of both individual and organizational actors as independent rational decision makers (Ford et al, 2003: 2-9). It is also critical to the highly static and micro-economic underpinnings of marketing mix within marketing (Kotler et al 2002), industrial economics (Scherer & Ross, 1980) and, as mentioned earlier, the position school within strategy (Porter, 1980). Although it gradually evolved into a coherent theory, the majority of the research within the industrial network approach can be said to be inductive. The perspective is in many ways formulated from empirical findings, not by theoretical deduction.

The most basic assumption in the industrial network approach is that organizations need more resources than they can control (dependency) and that all resources are basically unique or different (heterogeneity). To be able to produce, an organization needs resources that fit each other and the organizations' capabilities. Since all external resources are heterogeneous a buyer needs to adapt to the seller and the specific recourses it will buy and use. This makes the buying and selling organizations in control of these recourses dependent on each other. The adaptation to each other's resources leads not only to dependence but also to lower transaction costs. Thus, relations develop to enable economic exchange and to exploit complementarities between network actors. The resulting network structure, including many actors and their resources, both enable and hinder transactions and industrial dynamics.

According to the network approach, network relations can consist of different types. They can be technical, time based, knowledge based, legal, and/or economic (Hammarkvist et al, 1982). Even if two firms that interact since many years, have adapted their technology and knowledge to each other, they might not be adapted to each other in a legal sense (integrated

by contracts or legal form). It can of course also be the other way around; within one legal unit there might be resources that do not fit each other and there might be no adaptation or interaction to make them fit. From this follows that the logic in the production system does not need to be tightly coupled to the governance structures of that system (Mattson, 1987).

Because resources are heterogeneous, every network relation is unique. Investments in relations (adaptations) contribute to stability and make positions in the network hard to change. But strong relations (high degree of adoption) also create trust and information flows. Strong network relations can therefore enable innovation, and network/industrial dynamics (Hammarkvist et al, 1982; Liljegren, 1988; Elg & Johansson, 1997). Summarizing the industrial network approach (or markets' as networks approach, as it is sometimes called) and contrasting it to theories influenced by economics (like theory of the firm and marketing mix), the following Table 1 can be drawn.

Markets as networks	**Markets as micro-economics**
Heterogeneity (complements)	Homogenity (substitutes)
Dependent actors	Autonomous actors
Relations (long term)	Economic ex-changes (isolated one-time business)
Dynamic	Static
Network structuring, adaptation	Optimizing each transaction

Table 1. Markets as networks vs. markets as micro-economics

During the 1980's the industrial network approach diffused internationally, influenced and blended into related research. The Strategic Management research evolved in a direction pointing against markets as networks. Porters "value chain" is a step in this direction (Porter, 1980) and "network" almost became a buzzword in the world of strategy. In the Strategic Management Journal articles about networks were booming (Figure 3)

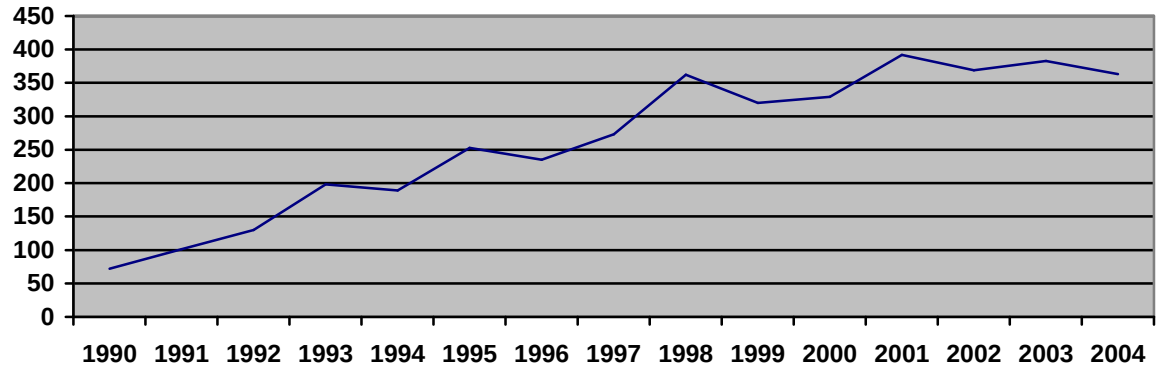

Figure 3 Number of hits in ABI inform when searching for Network AND Learning

In the strategic management literature networks are viewed as an unstable middle organizational form between market and hierarchy (Jarrilo, 1988). It is viewed as a solution for firms that cannot afford to buy another firm (or as a transitional phase in an integration process (Saxenian, 1990). Even though networks became appreciated as a strategic option and an alternative organizational form, the strategic management research still keeps the market –hierarchy dichotomy and the micro-economic assumptions intact. The industrial network approach spread fast in regards to terminology, but not to the same extent in regards to theory, at least not within strategic management research.

Within marketing and purchasing research a similar development could be observed. But here, also the theory behind the buzzwords diffused to a larger extent. Marketing research from an industrial network perspective iscentered around a network of researchers called IMP (Industrial Marketing and Purchasing Group, (www.impgroup.org;). IMP is arranging conferences and publishing books and papers (Gadde & Håkansson, 2001; Ford et al 2003). Ford et. al. (2003: 10-19) summarize the current industrial network approach well:

> "Business sales and purchasing do not occur in an anonymous market. Suppliers and customers tend to know each other well and to have worked with each other over time in their relationship. This relationship is not a matter of choice for either supplier or customer. Their relationship is both the outcome of their past interactions and affects each new interaction as it happens.
>
> We also emphasise the complexity of the world of business and the limitations on the freedom of companies to act independently. Business companies tend to be dependent on a limited number of counterparts for a large proportion of their purchases and sales.
>
> The outcome of an individual company's strategy will not just depend on its own actions, or even the reactions and re-reactions of a counterpart supplier or customer. It will also depend on the actions of specific competitors, co-developers and others that surround it. This means that successful management of inter-company relationships depends on understanding the nature and dynamics of the wider networks."

Industrial networks and boundaries

Compared to the research on alliances and joint ventures, the industrial network approach can be said to take the formal organizational boundaries less for granted. Even if networks often are said to be business networks between companies or firms, at least the early and more analytical texts views the networks as consisting of relations between production *recourses* (Håkansson, 1982; Mattsson, 1987). If these relations are between resources within and between formal organizations (firms, divisions, functional departments or other formal organizational units) is not necessarily the most important aspect of the network according to the industrial network approach. The formal *governance structures* are only loosely coupled with the logic of the production system (Mattsson, 1987; Håkansson & Johansson, 1993).

Another formulation that problematizes the formal organizational boundaries within the industrial network approach is the distinction between formal and informal cooperative strategies in the *network* (Håkansson & Johanson, 1993). According to the industrial network approach the informal organization is not limited to relations within firms, but exists just as much between them.

Within the industrial network approach concepts like resources, actors, governance structures, firms, strategy and others are used frequently but not always with the same meaning or clearly defined. Gadde, Huemer and Håkansson (2003) try to structure the approach and offer a framework with three basic network dimensions: resources, activities and actors. 1) *Resources* can be said to be the original main focus. The main point is that resources are heterogeneous and always to some extent un-exploited. Firms are always dependent on other firms' resources and need to adjust to each other to be able to both exploit and develop resources. 2) *Activities* are all the interactions that build relationships in the network. There are both horizontal value-chains and distribution channels and competitive and collaborative relations with both suppliers, customers, competitors and allies. These relationships can be direct and indirect, existing or potential. No firm's activities can change the network of relations in isolation. All firms are both influencing and become influenced by each other's activities. The network *actors* are almost approximated with the strategic management's view of firms or companies. But the distinction between firm and environment is not advocated (Snehota, 1990). Actors can have very different relations to other actors depending on purpose. They can be social, financial, consist of exchange of services or goods etc. Networks are loosely connected systems of actors in which no firm can dominate. Still, there is always a network logic that, even though it is hard to interpret, can be analyzed (Gadde, Huemer and Håkansson, 2003). Such an analysis consists of describing different resources and their interdependencies, different activities that influence relationships in the network and what positions different actors have in the network structure. Also actors can be more or less active/passive. Some are settling with "playing a role in the activity structure" (Gadde, Huemer and Håkansson, 2003: 9), others are more ambitious trying to build trust, influencing and developing the network.

Even if the role of formal organizational boundaries is downplayed in theory, the formal organizations and their boundaries are not seldom left unproblematized in specific analyses or when conducting empirical studies. "Actors" are often equated with organizations or firms (Håkansson, et. al. 1999; Ford et. al., 2003; Gadde, Huemer & Håkansson, 2003). When business is said to be stable, it is often implied that same organizations or firms have done business with each other for many years. If it is the same people involved or not is usually not part of the analysis (Axelsson & Easton, 1992; Forsgren et. al., 1995; Håkansson, et. al. 1999). Since the diffusion and internationalization of the industrial network approach, the view of organizational boundaries has tended to become a little more similar to the strategic management approach. Despite the more sophisticated *theoretical* view on organizational boundaries, compared to the more strategic perspective on alliances and joint ventures, the network approach often treats formal organizational boundaries as semi-strong in the analysis of *empirical* phenomena like strategic actions or knowledge management.

Therefore the earlier and more analytical work within the industrial network approach might be more suitable for studying "boundary less management", compared with the later and more empirical and applied work. The dimensions or types of relations - technical, time based, knowledge based, legal, and/or economic (Hammarkvist et al, 1982) – could be a fruitful typology for understanding interaction in and between formal organizations. Also the loose coupling between the production system and the governance structures sophisticates the view on how networks function compared to the strategic management approach with a strong emphasizes on formal organizations and formal management.

Industrial networks and learning

Even if ”knowledge” is a used concept within the industrial network approach, it is not the first choice of use in conceptualizing the empirical world. This does not necessary mean that the industrial network approach has nothing to say about knowledge creation, transfer and management. What does exist is a good bulk of research about technological innovation, organizational and network dynamics and learning in and between organizations (Mattsson, 1987; Håkansson et al, 1999; Håkansson & Johanson, 2001; Ritter & Gemünden, 2003). The industrial network perspective views all these phenomena as network dynamics that are products of activities in or between actors. Technological innovation is not viewed as something a single actor can produce by itself but as something that many activities in the network can result in, often involving deliberate initiatives by many actors. All such initiatives always involve both competition and cooperation. To be able to innovate, learn or develop, any single actor needs to influence many other actors that might or might not benefit from the process. More specifically, organizational learning and knowledge transfer between firms is said to benefit from relations characterized by trust and cooperation and from firms being connected to large and active networks (Håkansson, et al, 1999a). Also actors’ ”network horizons” (Snehota, 1990; Anderson et al 1994) affect actors’ conduct and ability to both learn and influence. The ”horizon” is defined as a border in a focal firm’s view or awareness of its network (Snehota 1990: 146). ”Where the horizon ends, the environment starts” (Holmen & Pedersen 2003: 411). The other actors, their resources, and their activities in the network therefore constitute the innovative or learning capability of a firm. Not only in direct interaction with each other but also as mediator between actors that have indirect relations with each other.

Geographical clusters and innovation systems

While the industrial networks perspective focused on networks of organizations, often tied together in supply chain relations, the cluster and innovation systems literature focuses on networks of organizations established around a specific geographical area, with a main purpose of supporting knowledge exchange and creation (see Figure 4. on the temporal emergence of this stream of research).

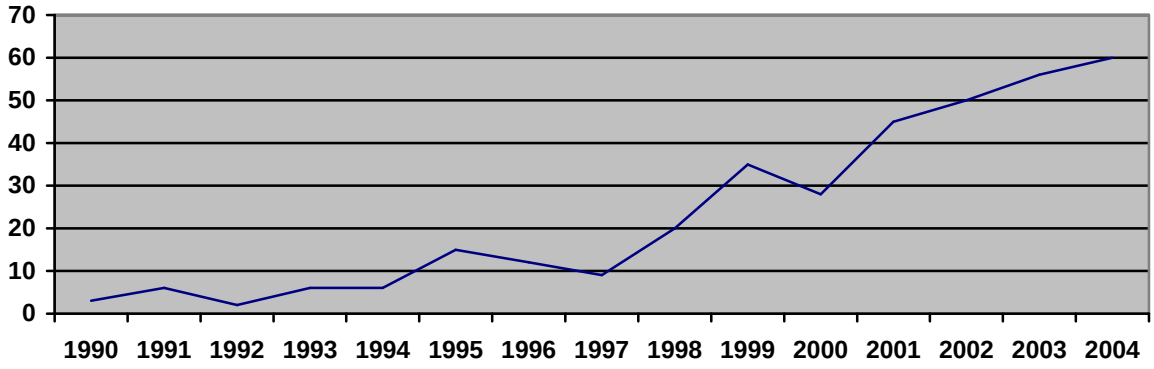

Figure 4. Hits in ABI when searchig for Regional cluster OR Innovation system

As argued above, complexity and specialization of knowledge increasingly force firms into collaborative arrangements for innovation. Innovation benefits of networking include risk sharing, obtaining access to new markets and technologies, speeding products to markets, pooling complementary skills, safeguarding property rights when complete or contingent

contracts are not possible and acting as a key vehicle for obtaining access to key knowledge. For some organizations, network relations may be so important and stable over time that one may talk about network capabilities in addition to firm-level capabilities (Lorenzen, 2001). The literature provides evidence that collaboration enhances organizations' ability to innovate:

> "evidence from the literature review also illustrates that those firms which do not co-operate and which do not formally or informally exchange knowledge limit their knowledge base on a long-term basis and ultimately reduce their ability to enter into exchange relationships" (Pittaway, Robertson, Munir, Denyer, & Neely, 2004, p. 145).

Such collaborations may, however, be hard to realize. The literature reviewed in the section on "learning in alliances and joint ventures" highlights some firm level characteristics that enable or hinder collaboration. The literature on innovation systems and clusters to be reviewed in this section focuses institutional characteristics i.e. the culture and infrastructure for networking and their effects on emerging collaborations between organizations. The legal system, banking and finance system, structure of labour market, education system, political system, etc. are all important aspects of the infrastructure that is required to assist the formation of business-to-business networks. There are also numerous efforts made to stimulate the institutional mechanisms including clusters, incubators, centres for cooperation, science parks, etc.

Breznitz (2005b) points at two research streams dealing with the institutional prerequisites for collaboration - industrial clusters and systems of flexible production and national innovation systems. *Cluster theory* focuses on the business structure as a facilitator of collaboration. A dynamic business structure, with multiple companies with different sizes not completely vertically integrated that compete and cooperate and buy from each other as observed in e.g. Silicon Valley is claimed to be supportive of interaction and thus innovation, while more rigid structures, with few, vertically integrated organizations encourage less interaction and thus innovation. These business structures were maintained not only by interacting companies but also by networks of professionals, financiers, lawyers and different modes of interaction with leading universities. Focusing on clusters thus brings into play a number of intermediaries (e.g. consultants, trade associations) and academic institutions, and points at their importance in spreading/brokering knowledge between organizations. Studies of clusters also highlight the importance of geographical proximity, as this brings down coordination costs related to both information and knowledge differences. Transaction cost reasoning is thus frequently applied in this stream of the literature when explaining clusters. (Lorenzen, 2001). Some information, such as gossip and subjective advice are hard to carry through other means than observation and face-to-face interaction, which are facilitated by physical proximity. This also facilitates the regulatory power of reputation effects, so managers may feel safer to trust each other. Geographical proximity is also argued to be important to achieve cultural proximity between partners in a network.

Innovation systems theory, working with evolutionary economics theory, arrives at similar conclusions, emphasizing interactions between actors from different parts of an innovation system, thus requiring the development of institutions that support such interaction.

While having different theoretical roots, both cluster theory and innovation systems theory research identify similar institutional characteristics of innovative high-tech system in that they fulfil two functions: information gathering, processing, developing and sharing; and industrial community identity creation. Central to supportive institutional structures is that

they simultaneously juggle contradictory requirements of competition and cooperation (see also Harding, 2001) and that they can facilitate both individual and collective learning processes. Institutions must infuse the system with trust and structured social meetings creating opportunities for actors to get to know each other. Breznitz (2005b) summarizes these institutional characteristics in the concept of collaborative public space. Focus is thus on creating trust and openness among parties who would not otherwise share information because of competitive situations in the market, which implies that boundaries are organizational and manifest in different competitive interests.

Pittaway et al. (2004) in a review of the evidence for links between networking and innovation points out the potential importance of institutional factors providing a networking infrastructure, such as consultants, professional associations, science partners, trade associations, business clubs, investment networks, clusters, centres of collaboration, industry networks, incubators, science parks, etc. However, they also conclude that the evidence for the effects of institutional factors is conflicting and that this is an area that is in great need of further research.

When it comes to the view of knowledge, this literature seldom explicitly discusses knowledge, but rather focuses on the knowledge intensive activities taking place in innovation. Capabilities and their complementarity are more often used terms than knowledge. Pittaway et. al (2004) e.g. discuss the need for different kinds of networking activities in developing different kinds of innovations. Lorenzen (2001) mentions the fact that some important information may require interaction and local presence to be transferred, thus providing a rationale for clusters.

Boundaries are to a large extent defined on a firm level, although some also discuss the importance of boundaries in inter-cluster collaboration. What is central to clusters is that they provide an environment in which firm boundaries are more permeable: “While coordination costs and barriers for creating new networking relations are low for incumbent firms within a cluster, there are often both practical and social entry barriers to newcomers” (Lorenzen, 2001, p. 8). The focus on identity building in innovation systems identified as common in the literature by Breznitz (2005b) illustrates a way of transcending organizational boundaries.

Social networks and communities of practice

Both the industrial network and the geographical clusters/innovation systems approaches focused on an agglomeration of organizations as the main level of analysis in understanding the exchange and creation of knowledge in an interorganizational context. The social network and communities of practice approaches instead focus on the relations between individual actors as carriers and creators of knowledge (the temporal emergence of this stream of research is illustrated in Figure 5).

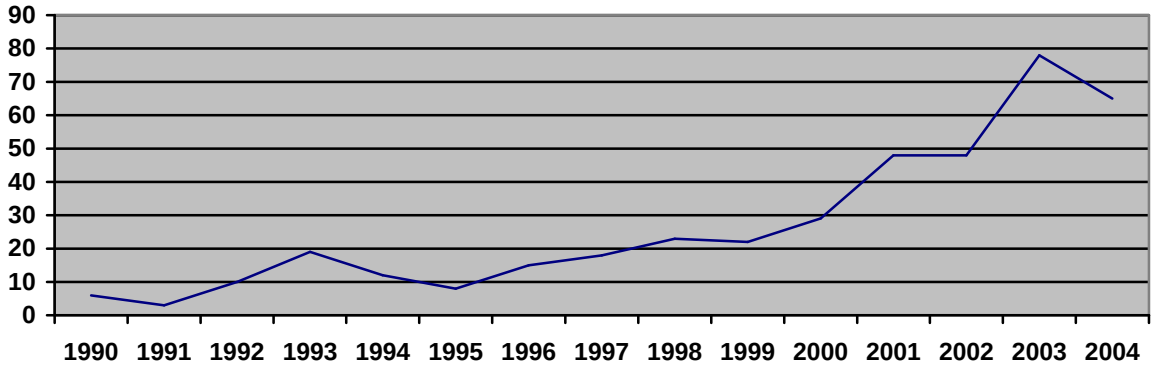

Figure 5. Number of hits when searching ABI for (Social Network OR Community of practice) AND learning.

Social network (analysis)

> ”..some firms afford an atmosphere of lively and productive exchange of ideas. In others, even relatively simple problems become difficult and even the best ideas seem have little chance of surviving. These differences seem to be related to the existence and structures of personal networks in organizations.” (Parker, 2004: 11)

Research that does focus the individual person and its network relations to other persons is the research on social or personal networks. At a first glance this research appears to be driven neither by an empirical nor a theoretical interest, but by applying a methodological technique on a wide range of subject matters. The formal social network analysis can be used to analyze everything from national economic statistics to interaction among monkeys, or even data from computer simulations (Monge & Contractor, 2003). Any set of quantitative data in the form of a matrix can be analyzed with quantitative network techniques and produce different types of network graphs. Usually this research focuses contacts or information flows between individual persons (Monge & Contractor, 2003). Data is usually gathered by interviews or questionnaires and a so-called ”snow-balling” procedure, or by monitoring communication through electronic media like e-mail (Wasserman & Faust, 1994). Once collected the network data can be analyzed in regard to different network or system properties. The analysis of these properties is conducted with the help of different and competing computer software products that both handle the calculus and the construction of network graphs.

But of course this method is not born out of nowhere, it has a history emanating both from theoretical interests and empirical studies. But it is hard to describe this field of research as a more or less coherent theoretical perspective. The field does not have a coherent, overarching framework for integrating conceptual, theoretical, and empirical work (Monge & Contractor, 2003). Parker (2004) identifies an anthropological foundation, going back to Malinowski’s exchange theory (Malinowski, 1922), and with close links to current research on social capital (Portes, 1988, 2000; Lin, 2001). An important distinction in both exchange theory and theories of social capital is between economic action and social action, or between formal structures and emergent networks. The two main ideas are that 1) social life cannot be reduced to economic exchanges between instrumentally acting individuals, and 2) the relation

between instrumental economic exchanges and less instrumental social interaction is complex.

Another (also related) field of research that has produced formal analysis of personal networks is the sociological or socio-economical ”embeddedness research” (Dacin, Ventresca, et al., 1999). According to this research individual actors' behavior is neither determined by cultural scripts nor is it a consequence of individual rational decisions. Instead actors' attempts of purposive actions are embedded in systems of social relations. The individuals' attempts of purposive actions give rise to properties of interactions that cannot be reduced to the individual actor (Granovetter, 1985). Properties like trust, division of labor, information transfer, innovation, career paths, competition, etc, are seen as largely shaped by socio-economic systems (Granovetter, 1973; Burt, 1992). And these properties can be described and analyzed by formal network analysis (Granovetter, 1985).

Both the anthropological and socio-economic fields of research express an old but still alive figure of thought that once was forcefully formulated in both philosophy and sociology. Hegel's distinction between work and the cunning consciousness on the one hand and social interaction and the mutual appreciative consciousness on the other (Habermas, 1984: 181-208), as well as Tönnies ([1887] 1963) Gemeinschaft and Gesellschaft are two famous formulations. In contemporary organizational analysis the distinction between the formal and informal are usually traced back to the so called human relations school and to the “Hawthorn Studies” (Roethlisberger & Dickson, 1947), and have since then been reinvented in endless variations of the same theme. Even if the formal social/personal/communicational network analysis maybe not offers any real theoretical sophistication of this theme, it does offer a technique to measure and describe *informal organizations*.

Once the data is collected it can be analyzed by a number of structural properties. There exist a large number of such properties and new ones are constantly invented. More common ones are; size, density, degree, connectedness, structural equivalence, path and graph-theoretic distance, and clustering or core/periphery structure (Burt, 1978; Alba, 1982; Monge, 1987; Albrecht & Bach, 1997; Borgatti & Everett, 1999; Schenkel, 2002). *Size* is the number of individuals in the network. *Density* is the ratio of actual number of links between network members to the maximum possible number of links. *Degree* is the average number of contacts that all network members have with other network members. *Connectedness* is a measure of how many number of contacts an individual has compared to the possible contacts available. *Structural Equivalence* refers to the degree to which two patterns of relationships of two network members are similar. *Path distance* is the shortest possible number of links between two network members. *Graph-theoretic distance* is the network members' average path distance. *Core/periphery structure* is the extent to which the network consists of just one core or many cores/subgroups/cliques.

With these and other properties, network members and network structures can be analyzed within one network or compared with other networks. Many measurements are of a mathematical kind and it is not always easy to understand how they can be applied to analyze empirical phenomena. But this is not always a drawback – given a specific interest or theoretical perspective, the different properties can be used to approximate aspects of reality that one wants to understand. Burt (1992) for example analyses social structures in a competitive business environment. Granovetter (1985) analyses how both individual and firm behavior are embedded in concrete, ongoing systems of social relations, and Schenkel (2002) applies network analysis to investigate the existence of “communities of practices” in a large construction project.

When it comes to knowledge sharing in networks, Cross et al (2001) identify 4 relational qualities of network relations that promote effective knowledge sharing:

- Knowledge: People must know what others know
- Access: People need to be able to access knowledge once identified, which depends on the closeness of relationship, physical proximity, organizational design, and collaborative technology.
- Engagement: Efficient knowledge transfer requires that seeker and provider get engaged in joint problem solving.
- Safety: Creativity and learning requires safety in the relationship.

Communities of Practice

Schenkel's (2002) analysis of "communities of practices" in a large construction project is of special interests in this context since the research on communities of practices (Brown & Duguid, 1991; Lave & Wenger, 1991; Wenger, 1998) overlaps with quantitative network analysis of informal groups. Schenkel makes use of this overlap and uses quantitative network analysis to operationalize what constitute a community of practice. According to Brown and Duguid (1991) communities of practices are informal groups characterized by a *shared repertoire* - the community's routines, conduct, gestures, language, and cognitive maps. Communities also have a *joint enterprise* – they do not only focus on accomplishing specific tasks but also try to develop their practice and general capability (Hackman, 1990). The joint enterprise makes the individual members committed to the community and binds the group together (Wenger, 1998). Communities of practice are also characterized by *mutual engagement* – by engaging with each other in the joint enterprise, the community is able to maintain and reproduce the members' shared repertoire. Individuals can learn to become members and to participate in the community (Lave & Wenger, 1991).

Schenkel (2002) shows that the conceptual framework of communities of practice, and its very qualitative definitions, can be seen as a special type of network in regards to specific structural properties. The quantitative network analysis can thus give the "soft" framework a little more "hard" appearance. But this also has some costs. There are some contradictions between the quantitative network analysis and the framework of communities of practice.

The first contradiction concerns that of hard vs. soft borders. The ideal case in network analysis is a network where individuals are either in or out. The network analysis explicitly strives for analysis of a full population (Wasserman & Faust, 1994). The boarders of a community on the other hand are not clear-cut. They depend on the varying degree of participation and to what extent individuals are accepted as members. These levels vary from fully integrated participating membership to total exclusion from the community (Wenger, 1998).

A second difference between the social network and the community of practice streams of research concerns the relationship to learning and performance. The communities of practice framework has a very positive view of the relationship between communities of practice, learning and performance. The network analysis is more neutral on this subject. Structural properties can just as well hinder as foster learning and or performance. It is not hard do find research that has a less romantic view on informal groups, learning and performance compared to the communities of practice framework.

Comparative table

	Alliances for learning	*Industrial networks*	*Innovation / diffusion /Clusters*	*Social networks*
Object of analysis	Firms/management Diades	In-determinate networks Resources, activities, actors	Groups of organizations – often geographically co-located	Individuals and their links to other individuals
Nature of the firm	Independent entity in competition with others	Embedded entity in a network of reciprocal dependencies	Cog in a system of information creation and exchange	Domicile of networked actors
Central boundaries and their characteristics	Organizational boundaries are important and strong, defined by the legal entity Boundaries define different organizational interests, cultures, views of knowledge…	Organizational boundaries are permeable and bridged in trustful relations Network boundaries are fuzzy and partly socially constructed.	Organizational boundaries are permeable and bridged in trustful relations Cluster boundaries define a distinctive “industrial community identity”	Organizational boundaries are viewed unimportant Community boundaries are clear. They define different identity, culture, language…
Beneficiary of interorganizational knowledge work	Firm/”owners”	Network/”society”	Geographic regions/”nation”/policy (firm)	Person/”profession”

Driver of cooperation	Competition - interaction gives competitive advantage	Inherent logic of value creation – Exploitation of complementary resources	Logic of value creation – interaction supports innovation/ knowledge creation	Individual knowledge/ information need; Identity in community of interest/ profession
Integrating mechanism in cooperation	Contract/ mutual profit	Activities/ mutual understanding of inter-dependence due to comple-mentary resources Trust	"Industrial community identity" Geographical proximity creating cultural proximity and trust	Common identity in profession/community of interest
Knowledge Characteristics	Objectified Carried by persons and objects	Embedded in network relations and activities	Embedded in persons and relations	Tacit, skills, identity, Embedded in community
Knowledge Dimensions	Tacit/ explicit Complex/ simple Private/ public Exploitation/ exploration	Network interaction and types of relations: technical, time based, knowledge based, legal, and/or economic Network horizon	Information (sharing)	Focus on network dimensions – centrality, structural holes, etc. Knowledge is multidimensional and embedded in action Tacit/explicit

View on learning	Access – Acquisition – joint knowledge creation	Development	Focus on outcome: Innovation Collective learning	Evolution/acculturation/socialisation/ Single loop
Enablers of interactive knowledge work	Relationship characteristics Knowledge characteristics “Absorptive capacity”	Network position e.g. central vs. peripheral Network horizon and network competence influence adaption and/or strategic action	Intermediaries Business structure Opportunities for relationship and trust building	Within network: Trust, reciprocal relations, common identity/language Between networks: boundary objects, knowledge brokers, collaboration …

Discussion

Different approaches to interorganizational knowledge work

Our reading of research on interorganizational knowledge work shows that there is a large bulk of research that emanates from many and somewhat different approaches to understanding collaboration in and between organizations. Our empirical interest, our phenomenon, has received considerable attention from many perspectives. Regardless of approach, there seems to be a general consensus that interorganizational collaboration is central to organizational success. Collaboration is both a way for organizations to access external recourses (like knowledge), lower transaction costs (through adaptive learning), and to improve innovation (in the meeting between different stocks of knowledge).

Most of the research is thus treating interorganizational knowledge work as something basically good. There is a positive stance to collaboration in all four of the approaches we have described above. In the literature on social networks and communities of practice this positive stance is very present. It almost seems to be an un-reflected assumption, that cooperation between individuals is always better than competition. In the literature on industrial networks and on clusters and innovation systems, the basic stance to interorganizational collaboration is positive, but it is at the same time somewhat problematized. Building trust, adapting to partners, investing in interorganizational relations can besides all good effects, also involve risks like becoming "locked in" in the existing network structure and thereby missing opportunities to develop even better ways to collaborate in the network/cluster.

In the alliance literature the treatment of interorganizational collaboration is a bit more ambiguous. On the one hand the approach fully shares the positive view of collaboration that characterizes the other approaches. But, at the same time, the way that collaboration is described, motivated, elaborated and analyzed, indicates an almost contradictory stance – collaboration is a version of competition, even with the closest allies. In even the most genuine partnership relation one should try to maximize ones own benefits with as little input into the relation as possible. Alliances are to a large extent viewed as a zero-sum game. There are no real *mutual* benefits from partnership relations. Collaboration is seen as a specific version of competition that has some benefits, but also with some major drawbacks and risks involved. In any collaboration there are according to the strategic alliance literature, major risks of loosing control over resources, becoming dependent on the decisions of other powerful organizations, having leakage of ones strategic knowledge, etc. In all approaches except the literature on alliances, interorganizational collaboration is viewed as a more or less regular state of affairs. Collaboration is an empirical fact. In the strategic alliance approach competition is the natural state of affairs. This basic view of industrial relations as characterized by competition is also consistent with the alliance approach's view of both organizational boundaries and on knowledge. Also boundaries and knowledge are treated somewhat different in the four approaches to interorganizational knowledge work.

Knowledge according to the different approaches

The alliance literature treats knowledge as objective. Knowledge can be identified, measured, produced, stored, moved, imitated, and so on in a rather unproblematic way. Knowledge has owners often in the form of firms, and gaining access to other firms' knowledge is one major motive for joining strategic alliances. At the same time protecting the own firm's knowledge from being duplicated or even stolen by other firms, including the ally is seen as a major part of managing interorganizational relations.

Even if the industrial network approach harbors a lot of objectivist and functionalist reasoning, the view of knowledge is less objective than in the alliance literature. The industrial networks include production systems that are built up by heterogeneous resources, and partly governed by a production logic. All this can be identified measured and elaborated in a more or less objective fashion. But the industrial network approach also includes actors - decision makers - that have different interpretations of the (more or less objective) resources and production systems. Actors are heterogeneous, have different network horizons, and are differently active in trying to reproduce or change the network structure. Also the development of interorganizational relations, network dynamics, innovation, etc are not seen as something firms can plan and decide by themselves, but as a product of many actors' interpretations of the network, their network situation and their direct and indirect interaction. Taken together this makes up a picture of knowledge as much more relational, embedded and fluid as compared to the picture painted by the alliance approach.

It is hard to identify one consistent view of knowledge in the social network analysis literature. It all depends on what kind of application of the network analysis one looks at. In the economic applications, knowledge is treated similar to the treatment within the strategic alliance literature. In the sociological, anthropological and organizational applications an interpretative or constructionist view of knowledge is dominating. In the communities of practice literature knowledge is viewed as tacit, highly social, and embedded in the community's shared repertoire - the community's routines, conduct, gestures, language, and cognitive maps. A community's general capability of performing their joint enterprise, is viewed as a social, shared, collective, or organic type of knowledge. Within a community there is no room for opportunistic interests or competition. Compared to the alliance literature's view of interorganizational collaboration as a sort of business competition, the communities of practice literature can be said to have an extreme opposite view - collaboration is rather defined as a joint enterprise and shared interests.

Neither approach can be said to be satisfying when trying to understand interorganizational knowledge work. There is no theoretical or empirical ground for either an objectivist approach assuming conflicting interest and zero-sum competition, or a constructionist approach assuming harmonic cooperation. It seems reasonable that a framework for doing good empirical studies of interorganizational knowledge work should allow for conflict, competition, collaboration, and cooperation. From a constructionist point of view there is no need to make any essential assumption in these dimensions. The character of social relations is rather something that is constructed in the specific empirical situation, and therefore has to be studied

empirically. Competition, cooperation, conflicting or overlapping interests should only be constructed ex-post empirical investigations.

Organizational boundaries and their role in interorganizational Knowledge work

Also when it comes to (organizational) boundaries, the four described approaches are treating the subject somewhat differently. In the alliance literature the objectivist stance and the underlying assumption of competition shines through also in the treatment of boundaries. Conflicting interests between firms (in the zero-sum competition) make the formal boundaries of these firms strong. Just as the conflicting interests and an objectivistic view of knowledge is taken for granted, the formal boundaries are treated as given. Besides this simplistic view of the formal organizational boundaries, one can find a complementary formulation; the conflicting interests also leads to mental boundaries. This is an interesting statement since it implies that, in empirical situations, in a close collaboration between firms, a focus on formal boundaries and competition might be quite mentally demanding for the interacting persons. (How) is it possible to create trustful relations if the main purpose is competition?

The industrial network approach does include objectivist reasoning regarding organizational boundaries, but contrary to the alliance literature, this reasoning is not in the form of a zero-sum competitive game. Because of the assumption of heterogeneous resources, the firms are generically dependent on each other and cooperation becomes a natural part of doing business. This also has consequences for the view of organisational boundaries. The relation between two resources need not be that different if the relation is inter- or intraorganizational. There is also constructionist reasoning in the industrial network approach. Different actors have different views of how the network looks and therefore how the organizational boundaries are drawn and ought to be drawn. Even if the formal boundaries exist there are other ways of drawing boundaries according to the industrial network approach. The perceived network logic of dependencies between heterogeneous resources need not overlap with the formal organizational boundaries.

In the literature on social networks the basic analytical units are the individual and the network of interacting individuals. It is suggested and used as a way of measuring the *informal* organisation. Instead of taking formal organizational boundaries for granted, boundaries are a question of what is possible to measure empirically and analysable with the quantitative analytical tools that the approach offers. A network/informal organization can have borders, clusters, cliques etc. The data can consist of either actual interaction (like measuring actual email correspondence) or actors' perceived interaction (like interviewing actors about their conduct). In both cases the social network analysis tries to say something about the actors' actual physical interaction, rather than something about their life worlds and perceived interaction. Thus, the social network analysis can be said to be objectivistic in its aim at describing objective hard boundaries in the informal organization.

In the perspective focusing innovation clusters boundaries are treated in a quite similar way as in the industrial network approach. A major difference is the higher

focus on geography and on institutional prerequisites. Geographical proximity and certain institutional characteristic/network infrastructure (professional associations, business clubs etc) can facilitate creation of trust and openness that facilitates interaction between otherwise competing firms. A network or "cluster identity" can therefore transcend the contradicting interests of zero-sum competition that underlies the alliance literature. The innovation cluster approach can thus be seen as a link between the strategic alliance literature and the other approaches described here. It both treats the formal organizational boundaries as a starting point, and offers a model for how they can be transcended.

To sum up the four approaches' view of boundaries one can state that:

1) Boundaries are most strongly enacted in the alliance literature linked to differing interests. Boundary crossing is generally seen as an anomaly and potentially problematic.

2) Other traditions have a more open view on boundaries. Crossing organizational boundaries is something natural and unavoidable. Mental and social boundaries, however, need to be overcome, which creates a need for processes of mutual learning/adaptation/trust building.

3) While organizational boundaries are downplayed, in several of the above research streams, other boundaries are pointed at as potentially important. Within the tradition of social networks, and especially communities of practice, the boundaries between communities are highlighted as important and difficult to pass for outsiders. Similarly innovation clusters build up an external border that may be hard to trespass by outsiders.

Rather than focusing one kind of boundary, we need to be aware of the interacting nature of different kinds of boundaries on different levels. Boundaries can be on a geographical, network, community or small group level. Boundaries can be formal/contractual, physical/interactional and mental/cultural. Boundaries have very much been taken for granted until know. However, the above review indicates that boundaries may be found on many different levels of analysis and be of different character. What is needed is an open-ended approach to boundaries in collaboration. Different boundaries may be at play at different times and spaces. Sometimes the formal boundaries might shape the interorganizational knowledge work, sometimes it might be the geographical, another time the cultural. We need a framework that can fuel empirical analysis of when, why and how this happens.

Managing interorganizational knowledge work

Our above review of the literature dealing with interorganizational knowledge work brings forward a number of variables on different levels of analysis affecting knowledge work. Some of the more central of these are summarized in figure 2 in an effort to provide an integrative framework for understanding interorganizational knowledge work.

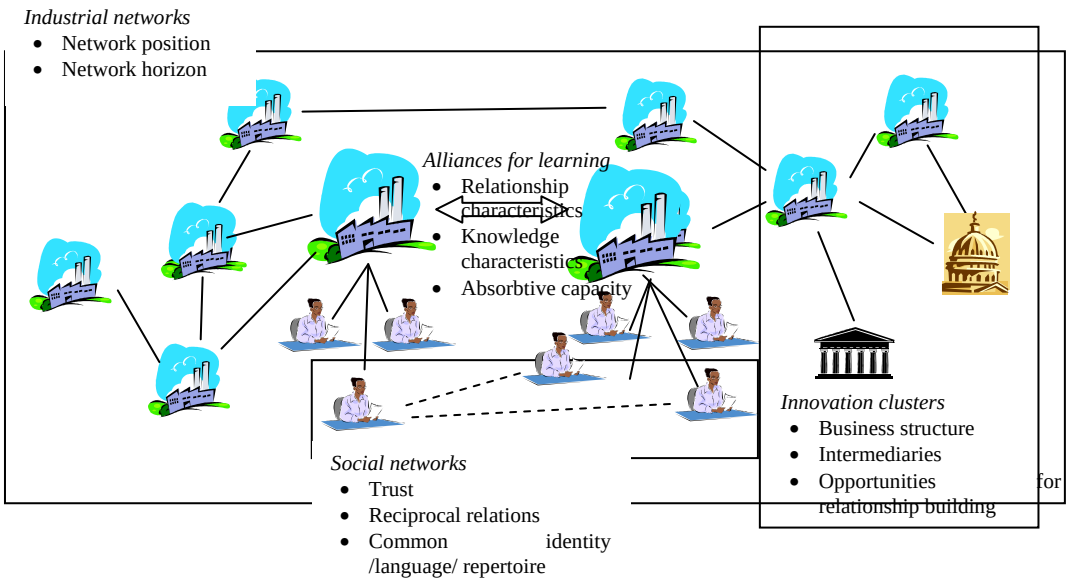

Figure 6. Different approaches to interorganizational knowledge work and their key concepts

Depending on the level of analysis on which interorganizational knowledge work is approached (interpersonal relations, interorganizational relations, organizational networks or (geographical) regions), different factors are identified as important in shaping the collaboration and facilitating it. Viewing interorganizational collaboration as taking place through interpersonal networks highlights the importance of interpersonal trust and reciprocal relations as well as a common identity and language as important facilitators of collaboration. Interorganizational boundaries in this context seem to be rather easily crossed by such interpersonal networks.

Looking at interorganizational collaboration from an alliance perspective makes a different set of aspects salient as enablers of interorganizational knowledge work, including relationship characteristics (e.g. the collaborating firms' respective positions in the value chain), knowledge characteristics (e.g. the tacitness of the knowledge) and the firms' absorptive capacity (their abilities to appropriate knowledge in the relationship). Cooperation between non-competing actors, with established trustful and open relationships, and partly overlapping knowledge bases, cooperating around rather explicit knowledge is generally viewed as easier and less problematic than the opposite.

The kind of interorganizational collaboration discussed in the alliance perspective, however, doesn't take place in a vacuum. This collaboration may be viewed as embedded in industrial networks, where collaboration between organizations is viewed as a natural aspect of making business. Rather than looking at the collaboration between two organizations, focus shifts towards the focal organization's position in the network, its set of different relations, and its perception of the network and its boundaries (network horizon). A central position in the network is here generally viewed as giving the organization better access to knowledge than a peripheral position.

Interorganizational collaboration may also be viewed as embedded in an innovation cluster, which again highlights partly different aspects of interorganizational

knowledge work. This stream of the literature emphasizes the role of intermediaries as interesting partners in interorganizational knowledge work. Intermediaries, such as consultants, are often viewed as important carriers of knowledge between organizations. Furthermore, needs and opportunities for relationship building are viewed as important facilitators of interorganizational collaboration. Such needs and opportunities may be created by the business structure or institutionalized arenas, encouraging interpersonal networking and the creation and reinforcement of a distinctive community identity, which overrides colliding interests of individual organizations.

Taken together, the above review thus indicates that interorganizational knowledge work is not an isolated issue between two organizations, but rather takes place within the context of industrial networks and innovation clusters which in turn may be permeated by social networks crossing both organizational, network and cluster boundaries. The above review thus illustrates that organizational boundaries may not be as important in understanding interorganizational knowledge work as indicated by e.g. the "alliances for learning" literature. However, there may be other kinds of boundaries that may be of importance instead – such as that between industrial networks, communities of practice or innovation clusters.

In sum, managing interorganizational knowledge work is a complex task involving not only organizational boundaries, but also other kinds of boundaries, where one set of boundaries may bridge another set of boundaries. The literature has, however, been rather fuzzy when it comes to how to manage such relations. More focus has been put on understanding why relations are formed than on how they are managed (Barringer et al., 2000). Our review has identified a number of different variables that may facilitate interorganizational knowledge work. Their relative importance and internal relations, however, remain to be investigated.

References

Aadne, J. H., von Krogh, G., & Roos, J. 1996. Representationism: The traditional Approach to Cooperative Strategies. In G. von Krogh, & J. Roos (Eds.), ***Managing Knowledge - Perspectives on cooperation and competition***: 9-31. London: Sage.

Ackroyd, S., & Lawrenson, D. 1996. Knowlege-work and organizational transformation: analysing contemporary change in the socal use of expertise. In R. Fincham (Ed.), ***New Relationships in the Organized Professions***. Aldershot: Avebury.

Alba, R. D. 1982. Taking Stock of Network Analysis: A Decade's Results. In: Bacharach, S. B. (Ed.) ***Research in the Sociology of Organizations***. Greenwich,CT: JAI Press. 39-74.

Albrecht, T. L. & Bach, B. W. 1997. ***Communication in Complex Organizations: A Relational Approach***. Orlando, FL: Harcourt Brace & Company.

Anderson, J. C., Håkansson, H. & Johanson, J. 1994. Dyadic business relationships within a business network context. ***Journal of Marketing***, 58: 1-15.

Autio, E., Hameri, A.-P., & Vuola, O. 2004. A framework of industrial knowledge spillovers in big-science centers, ***Research Policy***, Vol. 33: 107.

Axelsson, B. & Easton, G. 1992. ***Industrial Networks. A New View of Reality***. London: Routledge.

Badaracco, J. L. 1991. ***The Knowledge Link***. Boston, MA.: Harvard Business School Press.

Barringer, B. R., & Harrison, J. S. 2000. Walking a Tightrope: Creating Value Through Interorganizational Relationships, ***Journal of Management***, Vol. 26: 367: Elsevier Science Publishing Company, Inc.

Borgatti, S. P. & Everett, M. G. 1999. Models of Core/Periphery Structures. ***Social Networks***, 21: 375-395.

Breznitz, D. 2005. Collaborative Public Space in a National Innovation System: A Case Study of the Israeli Military's Impact on the Software Industry. ***Industry & Innovation***, 12: 31.

Bidault, F., & Cummings, T. G. 1994. Innovation through alliances: expectations and limitations. ***R&D Management***, 24(1): 33-45.

Bogenrieder, I. 2002. Social Architecture as a Prerequisite for Organizational Learning, ***Management Learning***, Vol. 33: 197: Sage Publications, Ltd.

Borgatti, S. P., & Cross, R. 2003. A Relational View of Information Seeking and Learning in Social Networks, ***Management Science***, Vol. 49: 432: INFORMS: Institute for Operations Research.

Breznitz, D. 2005a. Collaborative Public Space in a National Innovation System: A Case Study of the Israeli Military's Impact on the Software Industry, ***Industry & Innovation***, Vol. 12: 31: Carfax Publishing Company.

Breznitz, D. 2005b. Collaborative Public Space in a National Innovation System: A Case Study of the Israeli Military's Impact on the Software Industry. ***Industry & Innovation***, 12: 31.

Brown, J. S. & Duguid, P. 1991. Organizational Learning and Communities of Practice. ***Organization Science***, 2: 40-57.

Burt, R. S. 1992. ***Structural Holes: The Social Structures of Competition***. Cambridge MA: Harvard University Press.

Cohen, W. M., & Levinthal, D. A. 1990. Absorbtive Capacity: A New Perspective on Learning and Innovation. ***Administrative Science Quarterly***, 35(1).

Cross, R., Parker, A., Prusak, L., & Borgatti, S. P. 2001. Supporting Knowledge Creation and Sharing in Social Networks, ***Organizational Dynamics***, Vol. 30: 100: Elsevier Science Publishing Company, Inc.

Cross, R., & Sproull, L. 2004. More Than an Answer: Information Relationships for Actionable Knowledge, ***Organization Science: A Journal of the Institute of Management Sciences***, Vol. 15: 446: INFORMS: Institute for Operations Research.

Cummings, J. N. 2004. Work Groups, Structural Diversity, and Knowledge Sharing in a Global Organization, ***Management Science***, Vol. 50: 352: INFORMS: Institute for Operations Research.

Dacin, T.M.., Ventresca, M. J., et al. (1999) The Embeddedness of Organizations: Dialogue and Directions. ***Journal of Management***. 25(3): 317-356.

Doz, Y. L. 1996. The Evolution of Cooperation in Strategic Alliances: Initial Conditions or Learning Processes? ***Strategic Management Journal***, 17: 55-83.

Elg, U. & Johansson, U. 1997. Decision making in inter-firm networks as a political process. ***Organization Studies***, 18: 361-384.

Erickson, C. L., & Jacoby, S. M. 2003. THE EFFECT OF EMPLOYER NETWORKS ON WORKPLACE INNOVATION AND TRAINING, ***Industrial & Labor Relations Review***, Vol. 56: 203: Cornell University.

Ferlie, E., Fitzgerald, L., Wood, M., & Hawkins, C. 2005. THE NONSPREAD OF INNOVATIONS: THE MEDIATING ROLE OF PROFESSIONALS, ***Academy of Management Journal***, Vol. 48: 117: Academy of Management.

Fitzgerald, L., Ferlie, E., Wood, M., & Hawkins, C. 2002. Interlocking interactions, the diffusion of innovations in health care, ***Human Relations***, Vol. 55: 1429: Sage Publications, Ltd.

Ford, D, Gadde, L.-E. Håkansson, H. & Snehota, I. 2003, 2nd edition. ***Managing Business Relationships***. New Jersey: Wiley.

Forsgren, M., Hägg, I., Håkansson, H., Johanson, J. & Mattsson, L.-E. 1995. ***Firms in Network: A New Perspective on Competitive Power***, ACTA, 38, Stockholm: Almquist & Wiksell International.

Freeman, J. H. 1982. Organizational Life Cycles and Natural Selection Processes. In: Staw, B. M. & Cummings, L. L (eds.) ***Research in Organizational Behavior***, 4: 1-32. Greenwich, CT: JAI Press.

Gadde, L.-E. & Håkansson, H. 2001. ***Supply Network Strategies***. Chichester: Wiley.

Gadde, L.-E., Huemer, L. & Hålansson, H. 2003. Strategizing in industrial networks, ***Industrial Marketing Management***, 32(5): 357-364.

Gerwin, D., & Ferris, J. S. 2004. Organizing New Product Development Projects in Strategic Alliances. ***Organization Science: A Journal of the Institute of Management Sciences***, 15: 22.

Granovetter, M. (1973) The Strength of Weak Ties. ***American Journal of Sociology***. 78: 1360-1380.

Granovetter. M. (1985) Economic Action and Social Structure: The Problem of Embeddedness. ***American Journal of Sociology***. 91(3): 789-791.

Grant, R. M., & Baden-Fuller, C. 2004. A Knowledge Accessing Theory of Strategic Alliances. ***Journal of Management Studies***, 41: 61.

Guler, I., Guillén, M. F., & Macpherson, J. M. 2002. Global Competition, Institutions, and the Diffusion of Organizational Practices: The International Spread of ISO 9000 Quality Certificates, ***Administrative Science Quarterly***, Vol. 47: 207: Administrative Science Quarterly.

Habermas, J. (1984). ***Den rationella övertygelsen – en antologi om legitimitet, kris och politik*.** Stockholm: Akademielitteratur.

Hackman, J. (Ed.) 1990. ***Groups that Work (and those that don't): Creating Conditions for Effective Teamwork***. San Francisco, CA: Jossey-Bass.

Hammarkvist, K.-O., Håkansson, H. & Mattsson, L.-G. 1982. ***Marknadsföring för konkurrenskraft***. Malmö: Liber Förlag.

Harding, R. 2001. Competition and Collaboration in German Technology Transfer, ***Industrial & Corporate Change***, Vol. 10: 389: Oxford University Press / UK.

Heanue, K., & Jacobson, D. 2002. Organizational Proximity and Institutional Learning: The Evolution of a Spatially Dispersed Network in the Irish

Furniture Industry, ***International Studies of Management & Organization***, Vol. 32: 56: M.E. Sharpe Inc.

Hermens, A. 2001. Knowledge Exchange in Strategic Alliances: Learning in Tension. ***Creativity & Innovation Management***, 10: 189.

Holmen, E. & Pedersen, A.-C. 2003. Strategizing through analyzing and influencing the network horizon. ***Industrial Marketing Management***, 32: 409-418.

Holmqvist, M. 2003. Intra- and interorganisational learning processes: an empirical comparison. ***Scandinavian Journal of Management***, 19: 443.

Håkansson, H. (ed.) 1982. ***International Marketing and Purchasing of Industrial Goods - an Interaction approach.*** Chichester: John Wiley & sons.

Håkansson, H. & Johanson, J. 1993. The Network as a Governance Structure: Interfirm Cooperation Beyond Markets and Hierarchies. In: Grabher, G. ***The Embedded Firm***. London: Routledge.

Håkansson, H. & Johanson, J. 2001. ***Business Network Learning***. Amsterdam: Pergamon.

Håkansson, H. & Melin, L. (red.) 1978. ***Inköp***. Stockholm: P A Nordstedt & Söner Förlag.

Håkansson, H. Havila, V. & Pedersen, A.-C. 1999a. Learning in Networks. ***Industrial Marketing Management***, 28: 443-452.

Håkansson, H., Möller, K. K. & Halinen, A. 1999b. Business Relationships and Networks: Managerial Challenge of Network Era. ***Industrial Marketing Management***, 28: 413-427.

Håkansson, H. & Östberg, C. 1975. Industrial Marketing: An Organizational Problem? ***Industrial Marketing Management***, 4: 113-123.

Hägg, I. & Johanson, J. 1982. ***Företag i nätverk - ny syn på konkurrenskraft.*** Stockholm: SNS.

Inkpen, A. C. 2000. Learning Through Joint Ventures: A Framework Of Knowledge Acquisition. ***Journal of Management Studies***, 37: 1019.

Inkpen, A. C., & Dinur, A. 1998. Knowledge Management Processes and International Joint Ventures. ***Organization Science***, 19(4): 454-467.

Jarillo, J. C. 1988. On strategic networks. ***Strategic Management Journal***, 9(1): 31-41.

Kumar, R., & Nti, K. O. 1998. Differential Learning and Interaction in Alliance Dynamics: A Process and Outcome Discrepancy Model. ***Organization Science***, 9(3): 356-367.

Lahti, R. K., Darr, E. D., & Krebs, V. E. 2002. DEVELOPING THE PRODUCTIVITY OF A DYNAMIC WORKFORCE: THE IMPACT OF INFORMAL KNOWLEDGE TRANSFER, ***Journal of Organizational Excellence***, Vol. 21: 13: John Wiley & Sons, Inc. / Business.

Lave, J. & Wenger, E. 1991. ***Situated Learning: Legitimate Perpheral Participation***. Cambridge: Cambridge Uniersity Press.

Liebeskind, J. P., Oliver, A. L., Zucker, L., & Brewer, M. 1996. Social networks, Learning, and Flexibility: Sourcing Scientific Knowledge in New Biotechnology Firms, ***Organization Science: A Journal of the Institute of Management Sciences***, Vol. 7: 428: INFORMS: Institute for Operations Research.

Liljegren, G. 1988. ***Interdependens och dynamik i långsiktiga kundrelationer. Industriell försäljning i ett nätverksperspektiv***. Stockholm: EFI. Akademisk avhandling.

Lin, N. 2001. ***Social Capital: A Theory of Structure and Action***. Cambridge: Cambridge University Press.

Lorenzen, M. 2001. Preface. ***International Studies of Management & Organization***, 31: 3.

Malinowski, B. 1922. ***Argonauts of the Western Pacific: An Account of Native Enterprise and Adventure in the Archipelagoes of Melanesian New Guinea***. London: Routledge & Kegan Paul.

Mattsson, L.-G. 1976. Företagets oklara gränser, ***Forskningsprofil 75. Installationsföreläsningar vid Uppsala Universitet***. Uppsala Universitet.

Mattson, L.-G. 1987. Management of strategic change in a "market-as-networks perspective". In: Pettigrew, A. (ed.) ***The Management of Strategic Change***. London: Blackwell, pp. 234-256.

Mark, G. 2002. EXTREME COLLABORATION, ***Communications of the ACM***, Vol. 45: 89: Association for Computing Machinery.

Melander, A., & Nordqvist, M. 2002. Investing in Social Capital: Networks, Trust, and Beliefs in the Swedish Furniture Industry, ***International Studies of Management & Organization***, Vol. 32: 89: M.E. Sharpe Inc.

Melin, L. 1977. ***Strategisk inköpsverksamhet - organisation och interaktion***. Linköpings universitet, Ekonomiska institutionen, avhandling nr. 1.

Mohrman, S. A., Tenkasi, R. V., & Mohrman Jr, A. M. 2003. The Role of Networks in Fundamental Organizational Change, ***Journal of Applied Behavioral Science***, Vol. 39: 301: NTL Institute for Behavioral Sciences.

Monge, P. R. 1987. Network Level of Analysis. In: Berger, C. & Chaffee, S. (Eds.) ***Handbook of Communication Science***. Newbury Park, CA: Sage. 239-270.

Monge, P. R. & Contractor, N. S. 2003. ***Theories of Communication Networks***. Oxford: Oxford university Press.

Obstfeld, D. 2002. KNOWLEDGE CREATION, SOCIAL NETWORKS AND INNOVATION: AN INTEGRATIVE STUDY, ***Academy of Management Proceedings***: H1: Academy of Management.

Olivera, F. 2000. MEMORY SYSTEMS IN ORGANIZATIONS: AN EMPIRICAL INVESTIGATION OF MECHANISMS FOR KNOWLEDGE COLLECTION, STORAGE AND ACCESS, ***Journal of Management Studies***, Vol. 37: 811: Blackwell Publishing Limited.

Parker, P. 2004. ***How Personal Networks Shape Business: An antropological study of social embeddedness, knowledge development and growth of firms***. Lund: Lund University, Department of Sociology. Lund Monographs in social anthropology.

Pfeffer, J. & Salancik, G. R. 1978. ***The External control of Organizations - A Resource Dependence Perspective***. New York: Harper & Row Publishers.

Phan, P. H., & Peridis, T. 2000. Knowledge creation in strategic alliances: Another look at organizational learning. ***Asia Pacific Journal of Management***, 17: 201.

Pittaway, L., Robertson, M., Munir, K., Denyer, D., & Neely, A. 2004. Networking and innovation: a systematic review of the evidence, ***International Journal of Management Reviews***, Vol. 5/6: 137: Blackwell Publishing Limited.

Powell, W. W., Koput, K. W., & Smith-Doerr, L. 1996. Interorganizational collaboration and the locus of innovation: Networks of learning in biotechnology. ***Administrative Science Quarterly***, 41(1): 116.

Porter, M. E. 1980. ***Competitive Strategy***. New York: Free Press.

Portes, A. 1988. Social Capital: Its Origins and Application in Modern Sociology. ***Annual Review of Sociology***, 24: 1-24.

Reagans, R., & McEvily, B. 2003. Network Structure and Knowledge Transfer: The Effects of Cohesion and Range, ***Administrative Science Quarterly***, Vol. 48: 240: Administrative Science Quarterly.

Reagans, R., & Zuckerman, E. W. 2001. Networks, Diversity, and Productivity: The Social Capital of Corporate R&D Teams, ***Organization Science: A Journal of the Institute of Management Sciences***, Vol. 12: 502: INFORMS: Institute for Operations Research.

Rhee, M. 2004. Network Updating and Exploratory Learning Environment, ***Journal of Management Studies***, Vol. 41: 933: Blackwell Publishing Limited.

Ring, P. S., & Van de Ven, A. H. 1994. Developmental Processes of Cooperative Interorganizational Relationships. ***Academy of Management Review***, 19(1): 90-118.

Rittner, T. & Gemünden, H. G. 2003. Network competence: its impact on innovation success and its antecedents. ***Journal of Business Research***, 56: 745-755.

Roethlisberger, F. J. & Dickson, W. J. 1947. ***Management and the Worker.*** Cambridge, MA: Harvard University Press.

Saxenian, A. 1990. Regional Networks and the Resurgence of Silicon Valley, ***California Management Review***, (Fall): 89-112.

Schenkel, A. J. 2002. ***Communities of Practice or Communities of Discipline - Managing Deviations at the Øresund Bridge***. Stockholm: EFI. Dissertation.

Scherer, F. M. & Ross, D. R. 1980. ***Industrial Market Structure and Economic Performance***. Boston, MA: Houghton Mifflin.

Simonin, B. L. 2004. An empirical investigation of the process of knowledge transfer in international strategic alliances. ***Journal of International Business Studies***, 35: 407.

Snehota, I. 1990. ***Notes on a Theory of Business Enterprise***. Uppsala: Uppsala University Department of Business Studies. Dissertation.

Soekijad, M., & Andriessen, E. 2003. Conditions for Knowledge Sharing in Competitive Alliances. ***European Management Journal***, 21: 578.

Teece, D. J. 1998. Capturing Value from Knowledge Assets: The new economy, markets for know-how, and intangible assets. ***California Management Review***, 40(3): 55-79.

Tsang, E. W. K. 1999. A Preliminary Typology of Learning in International Strategic Alliances, ***Journal of World Business***, Vol. 34: 211: Elsevier Science Publishing Company, Inc.

Tönnies, F. (1887) 1963. ***Community and Society*** (Gemeinschaft und Gesellschaft). New York, NY: Harper and Torchbook.

Uzzi, B., & Lancaster, R. 2003. Relational Embeddedness and Learning: The Case of Bank Loan Managers and Their Clients, ***Management Science***, Vol. 49: 383: INFORMS: Institute for Operations Research.

Wasserman, S. & Faust, K. 1994. ***Social Network Analysis: Methods and Applications***. Cambridge: Cambridge university Press.

Wathne, K., Roos, J., & von Krogh, G. 1996. Towards a Theory of Knowledge Transfer in a Cooperative Context. In G. von Krogh, & J. Roos (Eds.), ***Managing Knowledge - Perspectives on cooperation and competition***: 55-81. London: Sage.

Wenger, E. 1998. ***Communities of Practice: Learning, Meaning, and Identity***. Cambridge: Cammbridge University Press.

Zahra, S. A., & George, G. 2002. Absorbtive Capacity: A review, reconceptualization and extension. ***Academy of Management Review***, 27(2): 185-203.